**Photosynthesis Lab:**

**Observing Consumption of Carbon Dioxide and Production of Oxygen by Plants**

Photosynthesis, an essential process of life, is used to convert light energy into chemical energy. A plant (as well as some algae, protists, and bacteria) use light to convert water and carbon dioxide (CO2) into glucose (C6H12O6). Oxygen (O2) is given off as a waste product. Photosynthesis is represented in the equation below:

6H2O + 6CO2 🡪 C6H12O6 + O2

In this lab we will use an indicator to show the presence of CO2 and O2. Bromothymol blue, which turns from blue to yellow as pH decreases, was employed in these experiments to determine pH change (and therefore carbon dioxide production or use) in your samples. A change in the indicator will provide evidence that photosynthesis is occurring. Bromothymol blue changes from blue to yellow as CO2 increase and O2 decreases, and from yellow to blue as CO2 decrease and O2 increases.

**Scientific Question:** How does the environment of a plant (darkness vs light) effect photosynthesis?

**Hypothesis**: If \_\_\_\_\_\_\_\_\_\_\_\_, then \_\_\_\_\_\_\_\_\_\_\_\_ because \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Materials**:

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4 Test tubes

-2 Corks

-2 *Elodea* sprigs

- Bromothymol blue solution, 0.1%

- Hydrochloric acid, 0.1%

- Aged tap water or aquarium water

- Aluminum Foil

- Lamp

**Procedure:**

1. Label four test tubes 1-4. Label tubes 1 and 2 “light” and tube 3 and 4 “dark”. Fill each of the four test tubes about two-thirds with aged water.

2. Add 1 ml of bromothymol blue solution to each test tube and mix thoroughly.

3. Add one drop of dilute HCl solution to each test tube and mix the solution by covering the tube opening with your finger then inverting the tube. Repeat the process until the color of the liquid is uniformly yellow (pH is approximately 6.0). Once this color change has occurred, do not add any more HCl.

4. Using sharp scissors or a scalpel, make a diagonal cut across the bottom of the two healthy Elodea sprigs. Slowly place an *Elodea* sprig in test tube 1 and 3 to avoid any liquid overflow. Test tube 2 and 4 should just be liquid.

5. Cork each test tube and swirl the tubes to mix the contents. Record the initial color in table 1 and the analysis section of the lab.

6. Place the set of tubes labeled “light” in bright light for 30 to 40 minutes and the “dark” set in total darkness for 30 to 40 minutes. The “dark” set of tubes may also be wrapped with aluminum foil to prevent light from entering the tubes.

7. At the end of this period, observe and record the color of the liquid in each tube.

**Data:**

|  |  |  |
| --- | --- | --- |
| **Test Tube** | **Initial Color** | **Color after 30 minutes** |
| #1 Light – *Elodea* |  |  |
| #2 Light – Liquid |  |  |
| #3 Dark – *Elodea* |  |  |
| #4 Dark – Liquid |  |  |

**Data Analysis**:

1. In the experiment, you set up four different tubes. Two containing *Elodea* and the two that did not, two were placed in the light and two were not. What was the purpose of using all four tubes?

2. What caused the Bromothymol blue to change back to the blue color from yellow?

3. Why did the test tubes without the plants stay yellow?

4. What process is occurring in the lab?

3. Examine the three graphs below. Which do you think most accurately represents the results you would see if you were to increase light when performing of the experiment? Why?

**Conclusion:**

Write a conclusion based on the data you collected. Remember to reference your data (initial an final color) and relate your findings back to the equation for photosynthesis.